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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/743,533	MURATANI, HIROFUMI	
	Examiner	Art Unit	
	ANTHONY MACKOWEY	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 April 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed April 28, 2008 have been fully considered but they are not persuasive.

Applicant submits the Alattar reference "is silent with regard to mapping within a target space" and therefore does not teach or suggest "the first space and the space including a target space." Examiner concedes that the cited portions of Alattar's disclosure does not explicitly recite "mapping within a target space." However, in the Non-Final Office Action mailed January 28, 2008, the examiner clearly identified and described the portions of Alattar which disclosed elements of Alattar that correlated to the recited claim elements (see, for example, page 4, lines 6-16). Applicant has merely recited a few portions of the Alattar reference cited by the examiner and asserted that Alattar is "silent with regard to mapping within a target space." Applicant's arguments have failed to clearly articulate how the teachings of Alattar do not to correlate to the concepts of "mapping from a first space to a second space" and "the first space and the second space including a target space concerning embedding amounts" as applicant suggests, and therefore cannot be considered persuasive.

Applicant also submits both Muratani and Alattar fail to disclose or suggest "wherein the randomizing-function generation unit generates the randomizing function and computers the composite function to obtain the embedded target content being restored to the target content even if the target content is subjected to geometrical distortion after the composite function is embedded in the target content." This new limitation expresses the intended result of the

randomizing function generation unit generating the randomizing function and computing the composite function and does not further limit the structure of the generating unit or the function (steps) it performs and should not be patentable weight (see MPEP 2111.04). Regardless, Muratani teaches the object of the invention is to provide digital watermark embedding and detecting "having robustness against local distortion such as a StirMark attack and D-A-D conversion." (page 2, paragraph 30) Alattar also teaches watermarks should be robust to geometrical distortions, and teaches spread spectrum and scatter techniques make the message more impervious to manipulations and the gain control impacts the ability to recover the message (pages 3 and 4, paragraphs 46-51). As such, the goal of both Muratani and Alattar inventions to provide watermark embedding and detection where the original watermark can be recovered from a geometrically distorted host content, thereby the combination of Muratani and Alattar as suggested by the examiner also teaches and suggests the intend result recited in the new claim limitation.

Arguments analogous to those presented above in response to applicant's arguments for claim 1 may also be applied to claims 10 and 19-22 as they recited similar elements.

Applicant has provided no further arguments regarding claims 2-9 and 11-18 beyond noting their dependency from claims 1 and 10 respectively.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:

> Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.
>
> When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare In re Lowry, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and Warmerdam, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).
>
> In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035.
>
> Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. O'Reilly, 56 U.S. (15 How.) at 112-14. Moreover, it does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in Sec. 101.
>
> … a signal does not fall within one of the four statutory classes of Sec. 101.
>
> … signal claims are ineligible for patent protection because they do not fall within any of the four statutory classes of Sec. 101.

Claims 21 and 22 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 21 and 22 are drawn to functional descriptive material recorded on a computer-readable medium. Normally, the claim would be statutory. However, the specification, at page 45, lines 15-17 defines or exemplifies the claimed computer readable medium as encompassing statutory media such a "recording medium" as well as ***non-statutory*** subject mater such as a "communication medium".

"A transitory, propagating signal … is not a "process, machine, manufacture, or composition of matter." Those four categories define the explicit scope and reach of subject matter patentable under 35 U.S.C. § 101; thus, such a signal cannot be patentable subject matter." (*In re Petrus A.C.M. Nuijten;* Fed Cir, 2006-1371, 9/20/2007).

Because the full scope of the claim as properly read in light of the disclosure appears to encompass non-statutory subject matter (i.e., because the specification defines/exemplifies a computer readable medium as a non-statutory communication medium) the claim as a whole is non-statutory. The examiner suggests amending the claim to *include* the disclosed tangible computer readable recording media, while at the same time *excluding* the intangible transitory media such as the communication medium. Any amendment to the claim should be commensurate with its corresponding disclosure.

Claims 1-19 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 1-19 define an "apparatus". However, while the preambles define an "apparatus", the body of the claims lack definite structure indicative of a physical apparatus. Furthermore, the specification indicates that the invention may be embodied as pure software page 13, lines 18-21. Therefore, the claim as a whole appears to be nothing more than a of software elements, thus defining functional descriptive material per se.

Functional descriptive material may be statutory if it resides on a "computer-readable medium or computer-readable memory". The claim(s) indicated above lack structure, and do not define a computer readable medium and are thus non-statutory for that reason (i.e., "When functional descriptive material is recorded on some computer-readable medium it becomes

structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized" – Guidelines Annex IV). The scope of the presently claimed invention encompasses products that are not necessarily computer readable, and thus NOT able to impart any functionality of the recited program. The examiner suggests:

1. Amending the claim(s) to embody the program on "computer-readable medium" or equivalent; assuming the specification did NOT define the computer readable medium as a "signal", "carrier wave", "communication medium", or "transmission medium" which are deemed non-statutory; or

2. Adding structure to the body of the claim that would clearly define a statutory apparatus.

As the specification does define the computer-readable medium as a "communication medium" (see rejection of claims 21 and 22 under 35 U.S.C. 101 above), examiner suggests adding structure to the body of the claims that would clearly define a statutory apparatus. Examiner notes the disclosure of a multiprocessor on page 46, line 11.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of US 2002/0071593 A1 to Muratani (cited in IDS) and US 2002/0009208 A1 to Alattar et al. (Alattar). Examiner notes that the publication date of US 2002/0071593 is June 13, 2002 thus qualifying it as prior art under 35 U.S.C. 102(b) regardless of common inventorship.

Regarding claim 1, Muratani discloses a digital watermark embedding apparatus (Fig. 4; page 4, paragraph 76) comprising:

an acquisition unit configured to acquire a topological invariant as digital watermark information and a target content in which the digital watermark information is to be embedded (page 2, paragraphs 31-32; page 4, paragraph 76; page 6, paragraphs 128-129);

a function generation unit configured to generate a topological function corresponding to the topological invariant (pages 8-9, paragraphs 172-174); and

a function-embedding unit configured to embed the topological function in the target content (page 2, paragraph 33; page 6, paragraph 130; page 9, paragraphs 182-184).

Muratani further discloses the acquisition unit acquiring key information corresponding to the digital watermark information, a randomizing-function generation unit configured to generate a randomizing function based on the key information (page 15, paragraph 265; page 16, paragraph 272; Fig. 27) and mapping from a base space to a target space concerning embedding amounts (pages 8-9, paragraphs 164-174) but does not explicitly disclose mapping a first space to a second space and computing a composite function by composition of the randomizing function and the topological function, the first space and the second space including a target space concerning embedding amounts.

However, Alattar teaches an acquisition unit acquiring key information corresponding to the digital watermark information (page 4, paragraph 59) and a randomizing-function generation unit configured to generate a randomizing function based on the key information (page 9, paragraph 119), a randomizing function by mapping from a first space to a second space, and compute a composite function by composition of the randomizing function and the watermark message (pages 9-10, paragraphs 119-123, Alattar teaches the raw bits of the watermark signal are modulated with each bit of a pseudorandom binary number and scattered throughout the image blocks), the first space and the second space including a target space concerning embedding amounts (page 10, paragraphs 122-128, Alattar discloses different message bits may be encoded more redundantly and a gain controller increasing or decreasing the strength of the watermark.).

The teachings of Muratani and Alattar are combinable because they are both concerned with embedding digital watermarks. It would have been obvious to one of ordinary skill in the art at the at the time the invention was made to modify the digital watermark embedding apparatus taught by Muratani to include the acquisition unit acquiring key information corresponding to the digital watermark information and a randomizing-function generation unit configured to generate a randomizing function, based on the key information, a randomizing function by mapping from a first space to a second space, and compute a composite function by composition of the randomizing function and the topological function, the first space and the second space including a target space concerning embedding amounts, as taught by Alattar because it is well known in the art of digital watermarking that the use of a key generating a randomization function for composition with the watermark information (carrier signal of the watermark information)

increases the security of the watermark information because the technique makes the embedded information robust to attacks and resistive to removal of the watermark from the target content without the appropriate key. Furthermore, the spread spectrum technique and gain control taught by Alattar permits the watermark message to be embedded in a manner less likely to be noticed to the human eye (Alattar, page 10, paragraph 128).

The combination of Muratani and Alattar as presented above further discloses or suggests the randomizing-function generation unit generates the randomizing function and computes the composite function to obtain the embedded target content being restored to the target content even if the target content is subjected to geometrical distortion after the composite function is embedded in the target content (Muratani, page 2, paragraph 30; Alattar, pages 3-4, paragraphs 46-51, see discussion presented in Response to Arguments).

Regarding claim 2, Muratani further discloses the topological function includes a mapping from a base space concerning positions in the target content to a target space concerning embedding amounts, the mapping being based on the topological invariant (pages 8-9, paragraphs 164-174).

Regarding claim 3, Muratani further discloses the target content includes one of still image data and moving picture data (pages 6-7, paragraph 136); the base space is defined by pixel positions corresponding to the target content; and the target space is included in a topological space corresponding to a set of assignments of values to pixels composing the target

content (pages 8-9, paragraphs 164-174).

Regarding claim 4, Muratani further discloses the function generation unit generates topological function values which express the topological function (pages 8-9, paragraphs 172-174).

Regarding claim 5, the combination of Muratani and Alattar further discloses the randomizing-function generation unit generates composite function values by applying the randomizing function to the topological function values, the composite function values expressing the composite function (Alattar, pages 9-10, paragraphs 119-122).

Regarding claim 6, Muratani further discloses each of the topological function values and the composite function values indicate embedding amounts corresponding to positions in the target content (pages 9-10, paragraphs 182-185).

Regarding claim 7, Alattar further discloses the randomizing-function generation unit randomizes the topological function values using a block cipher based on the key information to generate the composite function values (page 4, paragraph 59; pages 9-10, paragraphs 119-122).

Regarding claim 8, Muratani further discloses the function-embedding unit embeds the topological invariant by varying the target content based on the composite function values (pages 9-10, paragraphs 182-185).

Regarding claim 9, Muratani further discloses the function generation unit generates the topological function corresponding to the topological invariant which includes a homotopy invariant (pages 9-10, paragraphs 182-185).

Regarding claim 10, Muratani discloses a digital watermark detection apparatus (Fig. 4; page 4, paragraph 78) comprising:

an acquisition unit configured to acquire key information corresponding to digital watermark information (page 15, paragraph 269; page 16, paragraph 272; Fig. 28) and a target content in which the digital watermark information is embedded (page 3, paragraphs 34; page 4, paragraph 78; page 6, paragraphs 132-133);

a function detection unit configured to detect a function embedded in the target content (pages 10-11, paragraphs 194-196;

a topological invariant computation unit configured to compute a topological invariant based on the function, and the topological invariant serving as digital watermark information page 3, paragraph 35; page 6, paragraph 134-135; page 10, paragraphs 197-198).

Muratani does not explicitly disclose an ordering-function generation unit configured to generate, based on the key information, an ordering function by mapping from a first randomized space to a second randomized space and compute a composite function by composition of the ordering function and the embedded function, the first randomized space and the second randomized space including a target space concerning embedding amounts.

However, Alattar teaches an acquisition unit configured to acquire key information corresponding to the digital watermark information and an ordering-function unit configured to generate, based on the key information, an ordering function by mapping from a first randomized space to a second randomized space, and compute a composite function by composition of the ordering function and the embedded function, the first randomized space and the second randomized space including a target space concerning embedding amounts (page 4, paragraph 59; page 18, paragraphs 217-218).

The teachings of Muratani and Alattar are combinable because they are both concerned with detecting digital watermarks. It would have been obvious to one of ordinary skill in the art at the at the time the invention was made to modify the digital watermark detecting apparatus taught by Muratani to include the acquisition unit acquiring key information corresponding to the digital watermark information and an ordering-function unit configured to generate, based on the key information, an ordering function by mapping from a first randomized space to a second randomized space, and compute a composite function by composition of the ordering function and the embedded function, the first randomized space and the second randomized space including a target space concerning embedding amounts as taught by Alattar because it is well known in the art of digital watermarking that the use of a key generating a randomization function for composition with the watermark information (carrier signal of the watermark information) increases the security of the watermark information because the technique makes the embedded information robust to attacks and resistive to removal of the watermark from the target content without the appropriate key the spread spectrum technique and gain control taught by Alattar permits the watermark message to be embedded in a manner less likely to be noticed

to the human eye (Alattar, page 10, paragraph 128). Thus, upon detection the key is required to generate the ordering function to reorder the composite function (composition of watermark information and randomization function) in order to retrieve the original watermark information.

The combination of Muratani and Alattar as presented above further discloses or suggests the ordering-function generation unit generates the ordering function and computes the composite function to obtain an embedded target content being restored to an original target content even if the target content is subjected to geometrical distortion after the digital watermark information is embedded in the target content (Muratani, page 2, paragraph 30; Alattar, pages 3-4, paragraphs 46-51, see discussion presented in Response to Arguments).

Regarding claim 11, Muratani further discloses the composite function includes a mapping from a base space concerning positions in the target content to a target space concerning embedding amounts, the mapping being based on the topological invariant (pages 8-9, paragraphs 164-174; pages 10-11, paragraphs 194-197).

Regarding claim 12, Muratani further discloses the target content includes one of still image data or moving picture data (pages 6-7, paragraph 136); the base space is defined by pixel positions corresponding to the target content; and the target space is included in a topological space corresponding to a set of assignments of values to pixels composing the target content (pages 8-9, paragraphs 164-174).

Regarding claim 13, Muratani further discloses the function detection unit detects function values which express the embedded function (pages 10-11, paragraphs 194-196).

Regarding claim 14, the combination of Muratani and Alattar further discloses the ordering-function generation unit generates composite function values by applying the ordering function to the function values, the composite function values expressing the composite function (Alattar, page 18, paragraph 217).

Regarding claim 15, Muratani further discloses each of the function values and the composite function values indicate embedding amounts corresponding to positions in the target content (pages 9-11, paragraphs 182-185 and 194-197).

Regarding claim 16, Alattar further discloses the order-function generation unit orders the function values using a block cipher based on the key information to generate the composite function values (page 4, paragraph 59; pages 9-10, paragraphs 119-122; page 18, paragraph 217).

Regarding claim 17, Muratani further discloses the composite function includes a mapping from a base space concerning positions in the target content to a target space concerning embedding amounts, the mapping being based on the topological invariant, the composite function including a parameter which is related to the topological invariant and determines the mapping (pages 8-9, paragraphs 164-174; pages 10-11, paragraphs 194-197); and

the topological invariant computation unit computes the topological invariant by acquiring the parameter based on the composite function values (pages 10-11, paragraphs 194-197).

Regarding claim 18, Muratani further discloses the topological invariant computation unit computes the topological invariant which includes a homotopy invariant (pages 9-11, paragraphs 182-185 and 194-197).

Regarding claims 19 and 21, Muratani further discloses a digital watermark embedding method (Fig. 5; page 6, paragraph 127) and a program stored in a computer-readable medium for enabling a computer to function as a digital watermark embedding apparatus (page 4, paragraph 81). Regarding the remainder of claims 19 and 21, arguments analogous to those presented above for claim 1 are applicable to claims 19 and 21.

Regarding claims 20 and 22, Muratani further discloses a digital watermark detection method (Fig. 6; page 6, paragraph 132) and a program stored in a computer readable medium for enabling a computer to function as a digital watermark detection apparatus (page 4, paragraph 81). Regarding the remainder of claims 20 and 22, arguments analogous to those presented above for claim 10 are applicable to claims 20 and 22.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY MACKOWEY whose telephone number is (571)272-7425. The examiner can normally be reached on M-F 9:00-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew C Bella/
Supervisory Patent Examiner, Art Unit 2624

AM
8/28/08